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Exercise - I (Conceptual Questions) Build Up Your Understanding

UNIT

1. Which of the following system of units is not based on units of mass, length and time alone ?
(1) SI (2) MKS
(3) FPS (4) CGS

2. Which of the following is not a fundamental physical quantity ?
(1) Mass (2) Length
(3) Temperature (4) Density

3. Which of the following is not the name of a physical quantity :-
(1) kilogram (2) impulse
(3) energy (4) density

4. Which of the following is not a unit of time ?
(1) microsecond (2) leap year
(3) lunar month (4) light year

5. Unit of energy in SI system is :-
(1) erg (2) calorie
(3) joule (4) electron volt

6. In the SI system, the unit of temperature is :-
(1) Degree centrigrade
(2) Degree Celsius
(3) Kelvin
(4) Degree Fahrenheit

7. The SI unit of momentum is :-
(1) $\frac{kg}{m}$ (2) $\frac{kg.m}{sec}$
(3) $\frac{kg.m^2}{sec}$ (4) kg × newton

8. SI unit of pressure is :-
(1) pascal (2) Dyne/cm^2
(3) cm of Hg (4) atmosphere

9. kg m/s^2 stand for the unit of :-
(1) Energy (2) acceleration
(3) Force (4) Momentum

10. N kg^{-1} is the unit of :-
(1) velocity (2) energy
(3) acceleration (4) force

11. If the unit of length is micrometre and unit of time is microsecond, the unit of velocity will be :-
(1) 100 m/s (2) 10 m/s
(3) micrometre/s (4) m/s

12. The unit of power is :-
(1) kilowatt (2) kilowatt-hour
(3) dyne (4) joule

13. Kilowatt-hour is a unit of :-
(1) electrical charge (2) energy
(3) power (4) force

14. One nanometer is equal to :-
(1) 10^9 mm (2) 10^{-6} cm
(3) 10^{-7} cm (4) 10^{-9} cm

15. The units nanometre, fermi, angstrom and attometre, arranged in decreasing order will read as :-
(1) angstrom, nanometre, fermi, attometre
(2) fermi, attometre, angstrom, nanometre
(3) nanometre, angstrom, fermi, attometre
(4) attometre, angstrom, fermi, nanometer

16. Which is the correct unit for measuring nuclear radii:-
(1) micron (2) millimetre
(3) agnstrom (4) fermi

17. Which of the following is usually a derived quantity?
(1) Mass (2) Velocity
(3) Length (4) Time

18. Temperature can be expressed as a derived quantity in terms of which of the following ?
(1) Length and mass
(2) Mass and time
(3) Length. mass and time
(4) None of these

19. Which of the following sets can not enter into the list of fundamental quantities in any system of units?
(1) length, mass, velocity
(2) length, time, velocity
(3) length, time, mass
(4) mass, time, velocity

20. The density of a liquid is 1000 kg m^{-3}. Its value in CGS system :-
(1) 1 gcm^{-3} (2) 0.1 gcm^{-3}
(3) 10 gcm^{-3} (4) 100 gcm^{-3}

21. The surface tension of a liquid is 70 dynes/cm. It may be expressed in M.K.S. system as :-
(1) 70 N/m
(2) 7 × 10^{-2} N/m
(3) 7 × 10^2 N/m
(4) 7 × 10^3 N/m

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22. Units of length, velocity and force are doubled. Which of the following is correct :-
(1) Units of time is doubled
(2) Unit of mass is doubled
(3) Unit of momentum is doubled
(4) Unit of energy is doubled

23. If the units of length, velocity and force are half, then the units of Power will be :-
(1) doubled
(2) halved
(3) one fourth
(4) remains unaffected

DIMENSIONS

24. A dimensionless quantity
(1) Never has a unit (2) Always has a unit
(3) May have a unit (4) Does not exist

25. A unitless quantity
(1) Does not exist
(2) Always has a nonzero dimension
(3) Never has a nonzero dimension
(4) May have a nonzero dimension

26. Which of the following physical quantities has neither dimensions nor unit ?
(1) angle
(2) Luminous intensity
(3) coefficient of friction
(4) Electric current

27. Dimensions of relative density is
(1) kg m^{-3} (2) $[ML^{-3}]$
(3) dimensionless (4) $[M^2 L^{-6}]$

28. Which of the following does not have dimensions of length ?
(1) fermi (2) micron
(3) angstrom (4) radian

29. The quantity having dimension –2 in the time is :-
(1) force
(2) pressure
(3) gravitational constant
(4) all of these

30. The dimensional formula $[ML^2T^{-2}]$ represents :-
(1) pressure
(2) linear momentum
(3) power
(4) energy

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31. Which pair has the same dimensions ?
(1) Work and power
(2) Density and relative density
(3) Momentum and impulse
(4) Latent heat and specific heat

32. Dimensions of one pair is same. Identify the pair:-
(1) Torque and energy
(2) Angular momentum and work
(3) Energy and pressure
(4) Light year and solar day

33. The method of dimensional analysis can be used to derive which of the following relations ?
(1) $N_0e^{-\lambda t}$
(2) $A \sin(\omega t + kx)$
(3) $\frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$
(4) None of the above

34. If dimensions of A and B are different, then which of the following operation is valid ?
(1) $\frac{A}{B}$ (2) $e^{-A/B}$
(3) A – B (4) A + B

35. Which of the following is incorrect statement
(1) A dimensionally correct equation may be correct
(2) A dimensionally correct equation may be incorrect
(3) A dimensionally incorrect equation may be correct
(4) A dimensionally incorrect equation is incorrect

36. Which of the following is incorrect ?
(1) All derived quantities may be represented dimensionally in terms of the base quantities
(2) A base quantity cannot be represented dimensionally in terms of other base quantities
(3) The dimension of a derived quantity is never zero in any base quantity
(4) The dimension of a base quantity in other base quantities is always zero.

37. If $x = at + bt^2$, where x is in metre and t is in hour(hr), then unit of b will be :-
(1) m^2/hr (2) m
(3) m/hr (4) m/hr^2

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38. A force is given by $F = at + bt^2$, where t is time. The dimensions of a and b are
(1) $[M\ L\ T^{-3}]$ and $[M\ L\ T^{-4}]$
(2) $[M\ L\ T^{-4}]$ and $[M\ L\ T^{-3}]$
(3) $[M\ L\ T^{-1}]$ and $[M\ L\ T^{-2}]$
(4) $[M\ L\ T^{-2}]$ and $[M\ L\ T^{0}]$

39. If $S = \frac{1}{3}ft^3$, 'f' has the dimensions of - (S = distance, t = time)
(1) $[M^0L^{-1}T^3]$ (2) $[M^1L^1T^{-3}]$
(3) $[M^0L^1T^{-3}]$ (4) $[M^0L^{-1}T^{-3}]$

40. The time dependence of a physical quantity P is given by $P = P_0 \exp(-\alpha t^2)$, where α is a constant and t is time. The constant α
(1) is dimensionless
(2) has dimensions $[T^{-2}]$
(3) has dimensions of P
(4) has dimensions $[T^2]$

41. Given the force $F = Pt^{-1} + Qt$. Here t is time. The unit of P is same as that of :-
(1) displacement (2) velocity
(3) acceleration (4) momentum

42. The force F, on a sphere of radius 'a' moving in a medium with velocity v is given by $F = 6\pi\eta av$. The dimensions of η are :-
(1) $[ML^{-1}T^{-1}]$ (2) $[MT^{-1}]$
(3) $[MLT^{-2}]$ (4) $[ML^{-3}]$

43. The force is given in terms of time (t) and displacement (x) by the equation :

$$F = A\cos Bx + C\sin Dt$$

Then, the dimensions of $\frac{D}{B}$ are :-
(1) $M^oL^oT^o$ (2) $M^oL^oT^{-1}$
(3) $M^oL^{-1}T^o$ (4) M^oLT^{-1}

44. For a body moving along x-axis, the distance travelled by body from a reference point is given as function of time t as $x = at^2 + b$, where a and b are constants, then the dimension of $\sqrt{ab}$ is same as :-
(1) speed (2) distance travelled
(3) acceleration (4) none of these

45. In the relation $y = r\sin(\omega t - kx)$ the dimensions of $\frac{\omega}{k}$ are :-
(1) $[M^0L^1T^0]$ (2) $[M^0L^1T^{-1}]$
(3) $[M^0L^0T^3]$ (4) $[M^0L^1T^0]$

46. A wave is represented by
$y = a\sin(At - Bx + C)$
where A, B, C are constants. The dimensions of A, B, C are
(1) T^{-1}, L, $M^0L^0L^0$ (2) T^{-1}, L^{-1}, $M^0L^0L^0$
(3) T, L, M (4) T^{-1}, L^{-1}, M^{-1}

47. For $10^{(at+3)}$, the dimensions of a is :-
(1) $M^0L^0T^0$ (2) $M^0L^0T^1$
(3) $M^0L^0T^{-1}$ (4) None of these

48. The equation $\frac{dv}{dt} = AT - Bv$ is describing the rate of change of velocity of a body falling from rest in a resisting medium. The dimensions of A and B are :-
(1) LT^{-3}, T (2) LT^{-3}, T^{-1}
(3) LT, T (4) LT, T^{-1}

49. If y represents distance and x-represents time, dimensions of $\frac{d^2y}{dx^2}$ are :-
(1) LT^{-1} (2) L^2T^2 (3) L^2T^{-1} (4) LT^{-2}

50. If energy (E), velocity (v) and force (F), be taken as fundamental quantities, then what are the dimensions of mass :-
(1) EV^2 (2) EV^{-2} (3) FV^{-1} (4) FV^{-2}

51. A system has basic dimensions as density [D], velocity [V] and area [A]. The dimensional representation of force in this system is :-
(1) AV^2D (2) A^2VD (3) AVD^2 (4) A^0VD

ERRORS

52. The significant digits in 200.40 are :-
(1) 4 (2) 5 (3) 2 (4) 3

53. Number of significant digits in 0.01230 is :-
(1) 3 (2) 4 (3) 5 (4) 6

54. Which of the following has the highest number of significant figures ?
(1) 0.007 m^2 (2) 2.64×10^{24} kg
(3) 0.0006032 m^2 (4) 6.3200 J

55. Given P = 0.0030 m, Q = 2.40 m and R = 3000m, the number of significant figures in P, Q and R are respectively :-
(1) 1, 2, 1 (2) 2, 3, 4
(3) 4, 2, 1 (4) 4, 2, 4

56. After rounding off the number 4621 to 2 significant digits the value becomes :-
(1) 4600 (2) 4500 (3) 4700 (4) 4720

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57. If L = 2.331 cm and B = 2.1 cm, then L + B = (According to significant figures)
(1) 4.431 cm (2) 4.43 cm
(3) 4.4 cm (4) 4 cm

58. Subtract 0.2 J from 5.27 J and express the result with correct number of significant figures :-
(1) 5.1 J (2) 5.06 J (3) 5.0 J (4) 5 J

59. In arithmetic 17.8 × 3.1143 = 55.4354. But as a result of experimental measurements the best way to express the product is :-
(1) 55.3454 (2) 55.4
(3) 55.44 (4) 55.435

60. The order of magnitude of the number 1013 is:-
(1) 1 (2) 2 (3) 3 (4) 4

61. The length of a rod is (11.05 ± 0.05) cm. What is the sum of lengths of two such rods :-
(1) (22.1 ± 0.05) cm (2) (22.10 ± 0.05) cm
(3) (22.1 ± 0.15) cm (4) (22.10 ± 0.10) cm

62. The external and internal radius of a hollow cylinder are measured to be (5.23 ± 0.015) cm and (4.89 ± 0.005) cm. The thickness of the wall of the cylinder is :-
(1) (0.34 0.02) cm (2) (0.17 0.02) cm
(3) (0.17 0.01) cm (4) (0.34 0.01) cm

63. The resistance is $R = \frac{V}{I}$ where V = (100 ± 5) volt and I = (10 ± 0.2) ampere. What is the total error in R ?
(1) 5 % (2) 7 %
(3) 5.2 % (4) $\left(\frac{5}{2}\right)$%

64. When a copper sphere is heated, maximum percentage change will be observed in–
(1) radius (2) area
(3) volume (4) none of these

65. If error in measuring diameter of a circle is 2%, the error in circumference of the circle would be :-
(1) 2% (2) 8% (3) 4% (4) 1%

66. The error is the measurement of volume of sphere is 1.5%. The error in the measurement of its diameter is :-
(1) 1% (2) 2% (3) 0.5% (4) 1.5%

67. There is an error of 2% in the measurement of side of a cube. The percentage error in the calculation of its volume will be :-
(1) 1% (2) 2% (3) 3 (4) 6%

68. A thin copper wire of length ℓ metre increases in length by 2% when heated through 10°C. What is the percentage increase in area when a square copper sheet of length ℓ metre is heated through 10°C ?
(1) 4% (2) 8%
(3) 16% (4) None of these

69. If $f = x^2$, then the relative error in f is :-
(1) $\frac{2\Delta x}{x}$ (2) $\frac{(\Delta x)^2}{x}$
(3) $\frac{\Delta x}{x}$ (4) $(\Delta x)^2$

70. The percentage error in the measurement of mass and speed are 2% and 3% respectively. How much will be the maximum error in the estimate of kinetic energy obtained by measuring mass and speed :-
(1) 11% (2) 8% (3) 5% (4) 4%

71. The heat generated in a circuit is dependent upon the resistance, current and time for which the current is flown. If the error in measuring the above are as 1%, 2% and 1% the maximum error in measuring heat will be
(1) 2% (2) 3%
(3) 6% (4) 1%

72. Percentage error in measuring the radius (R) and mass (M) of a solid sphere are 2% & 1% respectively. Then error in measurement of moment of inertia about to its diameter $\left(\text{i.e. } I = \frac{2}{5}MR^2\right)$ is :-
(1) 3 % (2) 6 % (3) 5 % (4) 4 %

73. The resistance R of a wire is given by the relation $R = \frac{\rho\ell}{\pi r^2}$. Percentage error in the measurement of ρ, ℓ and r is 1%, 3 % and 2% respectively. Then the percentage error in the measurement of R is
(1) 6% (2) 9% (3) 8% (4) 10%

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74. The pressure on a square plate is measured by measuring the force on the plate and the length of the sides of the plate. If the maximum error in the measurement of force and length are respectively 4% and 2%, the maximum error in the measurement of pressure is –
(1) 1% (2) 2% (3) 6% (4) 8%

75. What is the fractional error in g calculated from $T = 2\pi\sqrt{\ell/g}$? Given that fractional errors in T and ℓ are ±x and ±y respectively.
(1) x + y (2) x – y
(3) 2x + y (4) 2x – y

76. While measuring acceleration due to gravity by a simple pendulum a student makes a positive error of 1% in the length of the pendulum and a negative error of 3% in the value of the time period. His percentage error in the measurement of the value of g will be (Use time period of a simple pendulum, $T = 2\pi\sqrt{\frac{\ell}{g}}$) -
(1) 2 % (2) 4 %
(3) 7 % (4) 10 %

77. An experiment measures quantities a, b and c, and X is calculated from $X = ab^2/c^3$. If the percentage error in a, b and c are ±1%, ±3% and ±2% respectively, the percentage error in X will be –
(1) $\pm 13\%$ (2) ±7%
(3) ±4% (4) ±1%

78. A physical quantity X is given by $X = \frac{2k^3\ell^2}{m\sqrt{n}}$
The percentage error in the measurements of k,ℓ, m and n are 1%, 1%, 3% and 4% respectively. The value of X is uncertain by
(1) 8 % (2) 10 % (3) 12 % (4) None

79. A quantity is represented by $X = M^a L^b T^c$. The percentage error in measurement of M, L and T are α%, β % and γ % respectively. The percentage error in X would be
(1) $(\alpha a + \beta b + \gamma c)$ %
(2) $(\alpha a - \beta b + \gamma c)$ %
(3) $(\alpha a - \beta b - \gamma c)$ %
(4) None of these

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80. the dimensional formula of a physical quantity x is $[M^{-1}L^3T^{-2}]$. The error in measuring the quantities M, L, and T are 2%, 3% and 4%. The maximum percentage of error that occurs in measuring the quantity x is :-
(1) 9 (2) 10 (3) 14 (4) 19

81. The pressure P and volume V of a gas are related as $PV^{3/2} = K$, where K is a constant. The percentage change in the pressure for a decrease of 0.5% in the volume is :-
(1) –0.75% (2) 0.75%
(3) 1.50% (4) –1.50%

MEASUREMENT

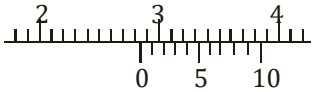
82. Zero error of an instrument introduces
(1) Systematic errors (2) Random errors
(3) Both (4) None of these

83. A pendulum clock, designed to give correct time in planes, gives incorrect time at hill station. Type of error in measurement of time can be :-
(1) Systematic error (2) Random error
(3) Gross error (4) None of these

84. A vernier callipers has 40 divisions on the vernier scale which coincide with 38 divisions on the main scale. The least count of the instrument is 0.1 mm. The main scale divisions are of
(1) 0.5 mm (2) 1 mm
(3) 2 mm (4) 1/4 mm

85. One centimetre on the main scale of vernier callipers is divided into ten equal parts. If 20 divisions of vernier scale coincide with 16 small divisions of the main scale, the least count of the callipers is
(1) 0.01 cm (2) 0.02 cm
(3) 0.05 cm (4) 0.005 cm

86. In main scale of a vernier callipers 1 cm divided into 10 equal divisions. The vernier scale has 10 equal divisions that correspond to 9 main scale divisions. The measured value by this calliper is :-



(1) 2.82 cm (2) 2.83 cm
(3) 2.87 cm (4) 2.89 cm

87. A student measured the thickness of a metal sheet using a screw gauge with least count 0.001 cm and listed the measurements. The correct measurement is –

(1) 4.2 cm (2) 4.22 cm

(3) 4.220 cm (4) 4.2200 cm

88. One full rotation of the cap of a screw gauge is equivalent to 5 mm. The cap has 100 division. Find the least count.

(1) 0.5 m (2) 0.05 mm

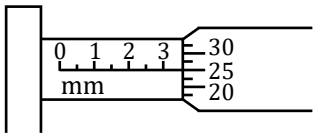
(3) 0.005 m (4) 5×10^{-4} m

89. Distance moved by a screw in 5 rotation is 5 mm and total number of circular divisions is 100. The least count of the screw gauge is :-

(1) 1 mm (2) 0.001 cm

(3) 0.0001 cm (4) 0.001 mm

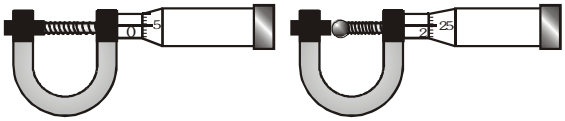
90. The number of circular division on screwgauge is 100. It moves 1 mm on main scale for one complete revolution. Find reading of micrometer.



(1) 3.25 mm (2) 3.24 mm

(3) 3.30 mm (4) 3.41 mm

91. The number of circular division on the shown screw gauge is 100. It moves 0.1 mm on main scale for one complete rotation and main scale has 1 mm marks. The diameter of the ball is :-



(1) 2.25 mm (2) 2.20 mm

(3) 1.20 mm (4) 1.25 mm

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	4	1	4	3	3	2	1	3	3	4	1	2	3	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	2	4	2	1	2	3	3	3	3	3	3	4	4	4
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	3	1	4	1	3	3	4	1	3	2	4	1	4	1	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	2	3	2	4	2	1	2	2	4	2	1	3	1	2	3
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	4	1	2	3	1	3	4	1	1	2	3	3	3	4	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	3	1	2	1	4	2	1	1	3	2	3	3	2	2	1
Question	91														
Answer	2														

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Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. The velocity v of a particle at time t is given by $v = at + \frac{b}{t+c}$, where a, b and c are constants. The dimensions of a, b and c are respectively :-

(1) LT^{-2}, L and T (2) L^2, T and LT^2

(3) LT^2, LT and L (4) L, LT and T^2

AIPMT 2007

2. Dimensions of electrical resistance is :–

(1) $[ML^2 T^{-3} A^{-1}]$ (2) $[ML^2 T^{-3} A^{-2}]$

(3) $[ML^3 T^{-3} A^{-2}]$ (4) $[ML^{-1} L^3 T^3 A^2]$

AIPMT 2008

3. Which two of the following five physical parameters have the same dimensions ?

(a) energy density (b) refractive index

(c) dielectric constant (d) Young's modulus

(e) magnetic field

(1) (a), (d) (2) (a), (e)

(3) (b), (d) (4) (c), (e)

4. If the error in the measurement of radius of a sphere is 2 % then the error in the determination of volume of the sphere will be :-

(1) 8% (2) 2 % (3) 4 % (4) 6%

AIPMT 2009

5. If the dimensions of a physical quantity are given by $M^aL^bT^c$, then the physical quantity will be :

(1) Force if a = 0, b = –1, c = – 2

(2) Pressure if a = 1, b = – 1, c = – 2

(3) Velocity if a = 1, b = 0, c = – 1

(4) Acceleration if a = 1, b = 1, c = – 2

AIPMT (Pre) 2010

6. The dimensions of $\frac{1}{2}\epsilon_0 E^2$, where ϵ_0 is permittivity of free space and E is electric field, is:-

(1) $[MLT^{-1}]$ (2) $[ML^2T^{-2}]$

(3) $[ML^{-1}T^{-2}]$ (4) $[ML^2T^{-1}]$

AIPMT (Mains) 2010

7. A student measures the distance traversed in free fall of a body, initially at rest in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is :-

(1) $e_1 + 2e_2$ (2) $e_1 + e_2$

(3) $e_1 - 2e_2$ (4) $e_2 - e_1$

AIPMT (Pre) 2011

8. The dimensions of $(\mu_0 \epsilon_0)^{-1/2}$ are :-

(1) $[L^{\frac{1}{2}}T^{-\frac{1}{2}}]$ (2) $[L^{-1}T]$

(3) $[LT^{-1}]$ (4) $[L^{-\frac{1}{2}}T^{\frac{1}{2}}]$

AIPMT (Mains) 2011

9. The density of a material in CGS system of units is 4 g/cm^3. In a system of units in which unit of length is 10 cm and unit of mass is 100 g, the value of density of material will be :-

(1) 0.04 (2) 0.4 (3) 40 (4) 400

AIPMT (Pre) 2012

10. If voltage across a bulb rated 220 Volt 100 Watt drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is :-

(1) 5% (2) 10% (3) 20% (4) 2.5%

NEET-UG 2013

11. In an experiment four quantities a, b, c and d are measured with percentage errors 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows $P = \frac{a^3b^2}{cd}$, percentage error in P is :-

(1) 4% (2) 14% (3) 10% (4) 7%

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AIPMT 2014

12. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are:

(1) $[F\ V\ T^{-1}]$ (2) $[F\ V\ T^{-2}]$
(3) $[F\ V^{-1}\ T^{-1}]$ (4) $[F\ V^{-1}\ T]$

AIPMT 2015

13. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, the dimensional formula of surface tension will be :

(1) $[EV^{-1}T^{-2}]$ (2) $[EV^{-2}T^{-2}]$
(3) $[E^{-2}V^{-1}T^{-3}]$ (4) $[EV^{-2}T^{-1}]$

Re-AIPMT 2015

14. If dimension of critical velocity v_c, of liquid flowing through a tube is expressed as $(\eta^x \rho^y r^z)$, where η, ρ and r the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x, y and z are given by :

(1) 1, 1, 1 (2) 1, –1, –1
(3) –1, –1, 1 (4) –1, –1, –1

NEET-II 2016

15. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length?

(1) $\sqrt{\frac{hc}{G}}$ (2) $\sqrt{\frac{Gc}{h^{3/2}}}$
(3) $\frac{\sqrt{hG}}{c^{3/2}}$ (4) $\frac{\sqrt{hG}}{c^{5/2}}$

NEET(UG) 2017

16. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of light, G is universal constant of gravitation and e is charge] :-

(1) $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ (2) $\frac{1}{c^2}\left[\frac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$
(3) $\frac{1}{c}G\frac{e^2}{4\pi\varepsilon_0}$ (4) $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

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NEET(UG) 2018

17. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001 cm. The main scale reading is 5 mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of – 0.004 cm, the correct diameter of the ball is :-

(1) 0.521 cm (2) 0.525 cm
(3) 0.053 cm (4) 0.529 cm

NEET(UG) 2019

18. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X=\frac{A^2B^{1/2}}{C^{1/3}D^3}$, will be :

(1) $\left(\frac{3}{13}\right)\%$ (2) 16% (3) –10% (4) 10%

19. The unit of thermal conductivity is :

(1) J m K^{-1} (2) J m^{-1} K^{-1}
(3) W m K^{-1} (4) W m^{-1} K^{-1}

NEET(UG) 2019 (Odisha)

20. The main scale of a vernier calliper has n divisions/cm. n divisions of the vernier scale coincide with (n – 1) divisions of main scale. The least count of the vernier calliper is,

(1) $\frac{1}{(n+1)(n-1)}$ cm (2) $\frac{1}{n}$ cm
(3) $\frac{1}{n^2}$ cm (4) $\frac{1}{n(n+1)}$ cm

NEET(UG) 2020

21. Taking into account of the significant figures, what is the value of 9.99 m – 0.0099 m ?

(1) 9.9 m (2) 9.9801 m
(3) 9.98 m (4) 9.980 m

22. Dimensions of stress are :

(1) $[M\ L^{-1}\ T^{-2}]$ (2) $[M\ L\ T^{-2}]$
(3) $[M\ L^2\ T^{-2}]$ (4) $[M\ L^0\ T^{-2}]$

23. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is :

(1) 1.0 mm (2) 0.01 mm
(3) 0.25 mm (4) 0.5 mm

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NEET(UG) 2020 (COVID-19)

24. The angle of 1' (minute of arc) in radian is nearly equal to
(1) 2.91×10^{-4} rad (2) 4.85×10^{-4} rad
(3) 4.80×10^{-6} rad (4) 1.75×10^{-2} rad

25. Time intervals measured by a clock give the following readings :
1.25 s, 1.24 s, 1.27 s, 1.21 s and 1.28 s.
What is the percentage relative error of the observations ?
(1) 2 % (2) 4 %
(3) 16 % (4) 1.6 %

NEET(UG) 2021

26. If force [F], acceleration [A] and time [T] are chosen as the fundamental physical quantities. Find the dimensions of energy.
(1) [F] [A] [T] (2) [F] [A] $[T^2]$
(3) [F] [A] $[T^{-1}]$ (4) [F] $[A^{-1}]$ [T]

27. A screw gauge gives the following readings when used to measure the diameter of a wire
Main scale reading : 0 mm
Circular scale reading : 52 divisions
Given that 1 mm on main scale corresponds to 100 divisions on the circular scale. The diameter of the wire from the above data is :
(1) 0.52 cm (2) 0.026 cm
(3) 0.26 cm (4) 0.052 cm

28. If E and G respectively denote energy and gravitational constant, then $\frac{E}{G}$ has the dimensions of :
(1) $[M^2]$ $[L^{-1}]$ $[T^0]$ (2) [M] $[L^{-1}]$ $[T^{-1}]$
(3) [M] $[L^0]$ $[T^0]$ (4) $[M^2]$ $[L^{-2}]$ $[T^{-1}]$

NEET(UG) 2022

29. Plane angle and solid angle have :
(1) Dimensions but no units
(2) No units and no dimensions
(3) Both units and dimensions
(4) Units but no dimensions

30. The dimensions $[MLT^{-2} A^{-2}]$ belong to the :
(1) self inductance
(2) magnetic permeability
(3) electric permittivity
(4) magnetic flux

RE-NEET(UG) 2022

31. The physical quantity that has the same dimensional formula as pressure is :
(1) Force
(2) Momentum
(3) Young's modulus of elasticity
(4) Coefficient of viscosity

32. The ratio of coulomb's electrostatic force to the gravitational force between an electron and a proton separated by some distance is 2.4×10^{39}. The ratio of the proportionality constant, $K = \frac{1}{4\pi\varepsilon_0}$ to the Gravitational constant G is nearly (Given that the charge of the proton and electron each $=1.6 \times 10^{-19}$ C, the mass of the electron = 9.11×10^{-31} kg, the mass of the proton = 1.67×10^{-27} kg):
(1) 1020 (2) 1030
(3) 1040 (4) 10

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	2	1	4	2	3	1	3	3	1	2	4	2	2	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	4	2	4	3	3	1	4	1	4	2	4	1	4	2
Question	31	32													
Answer	3	1													

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Exercise - III (Analytical Questions) Master Your Understanding

1. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Absolute error in a physical quantity may be +ve, –ve or zero.
Reason (R) : Absolute error is the difference of measured value and true value of a physical quantity.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

2. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Maximum possible error in a reading is taken as least count of the measuring instrument.
Reason (R) : Error in a measurement can not be greater than least count of the measuring instrument.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

3. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Higher is the accuracy of measurement, if instrument has smaller least count.
Reason (R) : Smaller the percentage error, higher is the accuracy of measurement.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

4. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : In a measurement, two reading obtained are 20.004 and 20.0004. The second measurement is more precise.
Reason (R) : Measurement having more decimal places is more precise.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

5. Given below are two statements :
Statement I : Absolute error is unitless and dimensionless.
Statement II : All types of errors are unitless and dimensionless.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both statement I and statement II are correct.
(2) Statement I is correct and statement II is incorrect.
(3) Statement I is incorrect and statement II is correct.
(4) Both statements I and statements II are incorrect.

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6. Given below are two statements :
Statement I : An exact number has infinite number of significant digits.
Statement II : A number which is not a measured value, has infinite number of significant digits.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both statement I and statement II are correct.
(2) Statement I is correct and statement II is incorrect.
(3) Statement I is incorrect and statement II is correct.
(4) Both statements I and statements II are incorrect.

7. Given below are two statements :
Statement I : Two physical quantities having same dimensions, may have different units.
Statement II : Shake and light year, both measure time.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both statement I and statement II are correct.
(2) Statement I is correct and statement II is incorrect.
(3) Statement I is incorrect and statement II is correct.
(4) Both statements I and statements II are incorrect.

8. Given below are two statements :
Statement I : Least count of a screw gauge is directly proportional to the number of divisions on circular scale.
Statement II : A screw gauge having a smaller value of pitch has greater accuracy.
In the light of the above statements, choose the most appropriate answer from the options given below :
(1) Both statement I and statement II are correct.
(2) Statement I is correct and statement II is incorrect.
(3) Statement I is incorrect and statement II is correct.
(4) Both statements I and statements II are incorrect.

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9. Match the quantities having same dimensions in column-1 and column-2 :

	Column-1		Column-2
A	Stress	p	Pressure
B	Strain	q	Energy density
C	Modulus of elasticity	r	Angle
D	Torque	s	Energy

(1) A → r ; B → p ; C → s ; D → q
(2) A → q ; B → r ; C → p ; D → s
(3) A → p ; B → s ; C → r ; D → q
(4) A → q ; B → s ; C → r ; D → q

10. Match the column :

	Column-1		Column-2
A	Electrical resistance	p	$M^{-1}L^{-2}T^{4}A^{2}$
B	Capacitance	q	$ML^{2}T^{-2}A^{-2}$
C	Magnetic field	r	$ML^{2}T^{-3}A^{-2}$
D	Inductance	s	$MT^{-2}A^{-1}$

(1) A → r ; B → p ; C → s ; D → q
(2) A → s ; B → p ; C → r ; D → q
(3) A → p ; B → s ; C → r ; D → q
(4) A → q ; B → s ; C → r ; D → q

11. Match the quantities in column 1 to dimensions in column 2. R is resistance, L is inductance, C is capacitance, H is latent heat and S is specific heat.

	Column-1		Column-2
A	LC	p	$L^{2}T^{-2}$
B	LR	q	$L^{2}T^{-2}K^{-1}$
C	H	r	T^{2}
D	S	s	$M^{2}L^{4}T^{-5}A^{-4}$

(1) A → r ; B → s ; C → p ; D → q
(2) A → s ; B → p ; C → r ; D → q
(3) A → p ; B → s ; C → r ; D → q
(4) A → q ; B → s ; C → r ; D → q

12. Match the column :

	Column-1		Column-2
A	Boltzmann constant	p	$ML^{2}T^{-1}$
B	Coefficient of viscosity	q	$ML^{-1}T^{-1}$
C	Planck constant	r	$MLT^{-3}K^{-1}$
D	Thermal conductivity	s	$ML^{2}T^{-2}K^{-1}$

(1) A → r ; B → s ; C → p ; D → q
(2) A → p ; B → s ; C → r ; D → q
(3) A → p ; B → r ; C → s ; D → q
(4) A → s ; B → q ; C → p ; D → r

13. Which two of the following five physical quantities have the same dimensions?
(a) Energy density
(b) Refractive index
(c) Dielectric constant
(d) Young's modulus
(e) Magnetic field
(1) (a) and (e) (2) (b) and (d)
(3) (c) and (e) (4) (a) and (d)

14. Which of the following are not a unit of time?
(a) Second (b) Parsec
(c) Year (d) Light year
(1) (b) and (d) (2) (b) and (c)
(3) (a) and (b) (4) (c) and (d)

15. Photon is quantum of radiation with energy $E = h\nu$ where ν is frequency and h is Planck's constant. The dimensions of h are the same as that of
(a) Linear impulse
(b) Angular impulse
(c) Linear momentum
(d) Angular momentum
(1) (a) and (c) (2) (b) and (d)
(3) (b) and (c) (4) (a) and (d)

16. Which of the following ratios express pressure?
(a) Force / area
(b) Energy / volume
(c) Energy / area
(d) Force / volume
(1) (a) and (c) (2) (b) and (d)
(3) (b) and (c) (4) (a) and (b)

17. **Statement–1 :** The displacement cannot be added with distance travelled.
Statement–2 : Addition of scalar and vector of same dimensions is not a meaningful algebraic operation.
(1) Statement–1 is True, Statement–2 is True; Statement–2 is a correct explanation for Statement–1.
(2) Statement–1 is True, Statement–2 is True; Statement–2 is not a correct explanation for Statement–1.
(3) Statement–1 is True, Statement–2 is False.
(4) Statement–1 is False, Statement–2 is True.

18. Match the column – I with column – II.

	Column-I (Number)		**Column-II (Number of significant digits)**
(A)	1001	(P)	5
(B)	0100.1	(Q)	4
(C)	100.100	(R)	6
(D)	0.001001	(S)	3

Options :-
(1) A → Q, B → Q, C → R, D → Q
(2) A → Q, B → P, C → R, D → R
(3) A → Q, B → S, C → S, D → Q
(4) A → Q, B → Q, C → P, D → Q

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	3	1	1	4	1	2	3	2	1	1	4	4	1	2
Question	16	17	18												
Answer	4	1	1												

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